



*Office of the President*

February 22, 2023

Dr. Emily Dow, Assistant Secretary  
Maryland Higher Education Commission  
6 N. Liberty Street  
Baltimore, MD 21201

Re: New Certificate Approval Request – Data Science A.S.

Dear Dr. Dow,

The College of Southern Maryland is proposing a new Data Science Letter of Recognition, Certificate and our new Associate of Science degree in Data Science.

Data Science is experiencing unprecedented growth across public and private sectors in response to a sustained explosion of data production. The Southern Maryland region is not unique in its urgent need for students and employees trained in Data Science.

The College of Southern Maryland's proposed new degree program is designed to prepare students for potential workforce entry upon completion and provide transfer pathways to bachelor's degree programs at four-year institutions.

As part of our proposed Data Science programs' Guided Pathway, a stackable nine-credit Data Science Letter of Recognition leads to an 18-19 credit Data Science Certificate culminating in a 60-61 credit Data Science AS degree. All courses in this proposed Data Science Certificate are a subset of CSM's proposed new Data Science AS program.

Upon approval of CSM's new Data Science AS program, this new academic program is being submitted for approval of CSM's proposed new Data Science Certificate.

Thank you for considering this new program.

Sincerely,

Yolanda Wilson, Ed.D  
President, College of Southern Maryland

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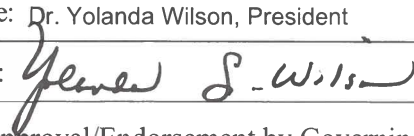
**Cover Sheet for In-State Institutions**  
**New Program or Substantial Modification to Existing Program**

Institution Submitting Proposal	College of Southern Maryland
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*Each action below requires a separate proposal and cover sheet.*

- |   |   |
|---|---|
| <input checked="" type="radio"/> New Academic Program | <input type="radio"/> Substantial Change to a Degree Program            |
| <input type="radio"/> New Area of Concentration       | <input type="radio"/> Substantial Change to an Area of Concentration    |
| <input type="radio"/> New Degree Level Approval       | <input type="radio"/> Substantial Change to a Certificate Program       |
| <input type="radio"/> New Stand-Alone Certificate     | <input type="radio"/> Cooperative Degree Program                        |
| <input type="radio"/> Off Campus Program              | <input type="radio"/> Offer Program at Regional Higher Education Center |

Payment <input checked="" type="radio"/> Yes	Payment <input type="radio"/> R*STARS # E0028107	Payment 850.00	Date
Submitted: <input type="radio"/> No	Type: <input type="radio"/> Check #	Amount:	Submitted:

Department Proposing Program	School of Professional and Technical Studies
Degree Level and Degree Type	Associate of Science
Title of Proposed Program	Data Science
Total Number of Credits	60
Suggested Codes	HEGIS: 519917.00 CIP: 30.7001
Program Modality	<input type="radio"/> On-campus <input type="radio"/> Distance Education (fully online) <input checked="" type="radio"/> Both
Program Resources	<input checked="" type="radio"/> Using Existing Resources <input type="radio"/> Requiring New Resources
Projected Implementation Date (must be 60 days from proposal submission as per COMAR 13B.02.03.03)	<input checked="" type="radio"/> Fall <input type="radio"/> Spring <input type="radio"/> Summer Year: 2023
Provide Link to Most Recent Academic Catalog	URL: <a href="http://www.catalog.csmd.edu">http://www.catalog.csmd.edu</a>
Preferred Contact for this Proposal	Name: Rachelle Andrews-Mobley
	Title: Academic Operations, Director
	Phone: (301) 934-7566
	Email: <a href="mailto:RAMobley@csmd.edu">RAMobley@csmd.edu</a>
President/Chief Executive	Type Name: Dr. Yolanda Wilson, President
	Signature:  Date: 1/31/2023
	Date of Approval/Endorsement by Governing Board:

Revised 1/2021

## **New Program Proposal**

### **Associate of Science in Data Science**

#### **A. Centrality to Institutional Mission and Planning Priorities:**

##### **1. Provide a description of the program, including each area of concentration (if applicable), and how it relates to the institution's approved mission.**

The College of Southern Maryland is proposing an Associate of Science degree program in Data Science totaling 60 credits. Students may choose program electives yielding 61 credits (see G4. List of Courses and Program Requirements below for details).

Every industry using computing systems is awash in data. A scientific approach to analyzing data allows stakeholders to monitor processes and engage in informed decision making.

CSM's Data Science program is organized around core coursework teaching students to manage, explore, model, and visualize data for descriptive, diagnostic, predictive and prescriptive analysis. This program will provide students with the underlying mathematical and computational foundations, hands-on experience with industry standard statistical and programming tools, as well as exploration of current ethical issues in the field of data science.

This Data Science AS Program is designed for transfer to four-year institutions requiring mathematical, computer science, information technology and data science preparation.

This proposed new Data Science program would support CSM's Mission which "... strengthens the economic vitality of a diverse and changing region by providing affordable postsecondary education, workforce development ..." through directly addressing the Data Science employee shortage by preparing students to work in entry-level positions as well transfer to four-year institutions.

CSM's Work Based Learning program and Career Services office assist students and employers in matching students with potential internships and employment during and after program completion. CSM's transfer office has confirmed interest in transfer agreements for this proposed program with bachelor's degree programs at four-year institutions.

##### **2. Explain how the proposed program supports the institution's strategic goals and provide evidence that affirms it is an institutional priority.**

CSM's mission statement affirms its commitment to the development of close partnerships among the college and its tri-county (Calvert, Charles, and St. Mary's Counties) regional community stakeholders. The proposed new Data Science program supports the following strategic goals in particular:

#1 "improve student progress and completion" by providing Data Science students with the same student support structures that we have strengthened in our current programs.

#2 "ensure equity in all programs and services goal" by subjecting this new program to the same renewed scrutiny and improvement that characterize our current programs.

#3 “build and sustain the regional workforce pipeline goal” by providing employers with employees and transfer students educated in a program recommended and reviewed by our Program Advisory Council.

#4 “foster and sustain a high-performing employee culture” by offering the CSM community at large the support of a vibrant and growing local data science community of faculty, staff, students, and employers

**3. Provide a brief narrative of how the proposed program will be adequately funded for at least the first five years of program implementation. (Additional related information is required in section L.**

The Technology Department is deactivating two out-of-date programs (Software Developer and Information Systems) and some of their relevant courses are finding a new home in the Data Science program.

The Information Systems program was essentially a hybrid program (half business and half technology classes) that filled the role of a business analytics program. Now that the Business department has its own Business Administration: Business Analysis Concentration program (using some of the same Information Systems Technology core classes) this allows us to replace the redundant Information Systems program with a true Data Science program composed entirely of Technology and Math department courses. (see G4. List of Courses and Program Requirements below for details)

No new course development is required since the proposed new Data Science program will make exclusive use of existing courses already offered at the College of Southern Maryland, therefore no additional costs are incurred by offering this program

**4. Provide a description of the institution’s commitment to:**

**a) ongoing administrative, financial, and technical support of the proposed program**

The proposed new Data Science program will be housed in the Technology Department of the School of Professional and Technical Studies at the College of Southern Maryland. The Technology Department also houses the Computer Science, Cybersecurity and Cloud & Information Technology programs. The department has a dedicated administrative assistant to support the new program. The same financial and technical support enjoyed by the current programs will be available to the new Data Science program as well.

**b) continuation of the program for a period of time sufficient to allow enrolled students to complete the program.**

The Technology Department has identified this program as the relevant option for students preparing for employment and continued education in data science with corresponding coursework in advanced mathematics, computer science, cloud & information technology as well as data science.

CSM's Technology Department Program Advisory Council has identified the creation of a Data Science Program in general and this proposal in particular as the highest priority for updating the Technology department program offerings going forward.

**B. Critical and Compelling Regional or Statewide Need as Identified in the State Plan:**

1. Demonstrate demand and need for the program in terms of meeting present and future needs of the region and the State in general based on one or more of the following:

a) The need for the advancement and evolution of knowledge

Data Science is described as the "fourth paradigm" of science, subsuming but not replacing the previous three paradigms of science: experimental, theoretical, and computational.

[https://digital.library.unt.edu/ark:/67531/metadc31516/m2/1/high\\_res\\_d/4th\\_paradigm\\_book\\_complete\\_lr.pdf](https://digital.library.unt.edu/ark:/67531/metadc31516/m2/1/high_res_d/4th_paradigm_book_complete_lr.pdf)

This emerging field underpins the technical processes and practices for a data driven society. CSM's proposed new Data Science program is designed to prepare program students, as well as the wider college and community at large, to engage in the technical, as well as ethical issues, unique to data science.

b) Societal needs, including expanding educational opportunities and choices for minority and educationally disadvantaged students at institutions of higher education

CSM, as an Achieving the Dream National Network College, is committed to strengthening student access and equity in every area of college programming. A CSM Data Science program would employ those same intentional practices to ensure expanding educational opportunities for underrepresented students as all our other programs.

c) The need to strengthen and expand the capacity of historically black institutions to provide high quality and unique educational programs

CSM, as an open access community college, provides equity and support for students seeking affordable, high quality local education in anticipation of transfer to HBCU institutions. CSM currently has transfer agreements (<https://www.csmd.edu/student-services/transfer-services/transfer-agreements/index.html>) with 3 of the 4 Maryland HBCUs in Cloud Computing, Computer Science, Cybersecurity and have had preliminary interest from 3 of the 4 Maryland HBCUs in a Data Science transfer agreement as well.

2. Provide evidence that the perceived need is consistent with the current **2022 Maryland State Plan for Postsecondary Education**.

MSPPSE Priority 5: *Maintain the commitment to high-quality postsecondary education in Maryland.*

As noted in the current 2022 Maryland State Plan for Post Secondary Education, the second Action Item lists the need to "Identify innovative fields of study." (p. 51, 2022 Maryland State Plan for Post Secondary Education,

[https://dlslibrary.state.md.us/publications/Exec/MHEC/ED11-105\(b\)\(3\)\(i\)\\_2022.pdf](https://dlslibrary.state.md.us/publications/Exec/MHEC/ED11-105(b)(3)(i)_2022.pdf))

In concert with our regional Technology Programs Advisory Council as well as our four-year college transfer partners, the field of Data Science has consistently been identified as the preeminent “innovative field of study” for students and employers the Southern Maryland region, as well as statewide.

The current 2022 Maryland State Plan for Post Secondary Education also notes that “(t)he Maryland Department of Commerce currently identifies ten key industries for Maryland:

1. Aerospace and defense;
2. Advanced manufacturing;
3. Agribusiness;
4. Life sciences;
5. Cybersecurity and IT;
6. Distribution and logistics;
7. Energy and sustainability;
8. Financial services;
9. Military and federal, and
10. Tourism.”

(p. 46, 2022 Maryland State Plan for Post Secondary Education,  
[https://dlslibrary.state.md.us/publications/Exec/MHEC/ED11-105\(b\)\(3\)\(i\)\\_2022.pdf](https://dlslibrary.state.md.us/publications/Exec/MHEC/ED11-105(b)(3)(i)_2022.pdf))

Data Science, as a hybrid statistical and computational field, is directly associated with 5. *Cybersecurity and IT* as well as 6. *Distribution and Logistics* industries. Data Science is also emerging as an integral component of every industry seeking employees to with skills leverage its data for analysis and decision making.

CSM’s Technology department has responded to unique opportunities to connect students and employees for internships and employment by designing and implementing a Job/Internship Student/Employer Process. In cooperation with the Work Based Learning Program and Career Services, our department hosts a student and employer contact page on our highly visible Cybersecurity website available to Data Science students.

CSM’s Data Science program would share the same commitment to high quality post-secondary education as our other Technology department programs. As an example, a recent Technology department equity initiative, Work-Learn-Play, in collaboration with CSM’s Information Management Technology department and Financial Aid Department (through Federal Work Study) provides paid internship positions for Technology department students.

CSM’s Technology department seeks to connect students outside the classroom with high quality educational experiences and opportunities. We have combined our student technology clubs, Association of Computing Machinery (ACM/ACM-W), Cybersecurity and the Data Science based National Student Data Corps (NSDC), into a single TechHawks club featuring weekly rotating club meeting with guest speakers and hand-on emerging technology projects meeting on campus as well as Zooming weekly.

MSPPSE Priority 6: *Improve systems that prevent timely completion of an academic program.*

In the context of the current COVID-19 pandemic, our proposed Data Science program would join the other Technology department programs that have been (re)designed for agility in delivering courses in dynamic operational environments to allow timely completion of programs. Technology department courses are now required to be built with Quality Matters universal design guidelines, deliverable in a range of formats from face-to-face to fully online, including hybrid formats using “HyFlex” classroom video systems for students joining our computer labs from home.

CSM, as part of Achieving the Dream, has sustained a well-developed effort to provide students with clear Guided Pathways to facilitate degree completion. The Data Science program would benefit from the same wraparound services developed for all of our programs’ Guided Pathways such as a stackable Letter of Recognition leading to a Certificate and culminating in an AS degree. (<https://www.csmd.edu/programs-courses/pathways/index.html>)

**C. Quantifiable and Reliable Evidence and Documentation of Market Supply and Demand in the Region and State:**

1. Describe potential industry or industries, employment opportunities, and expected level of entry (ex: *mid-level management*) for graduates of the proposed program.

Every industry and employer using computing systems is awash in data. A scientific approach to manage, explore, model and visualize that data allows stakeholders to monitor operations and engage in informed decision making. The Bureau of Labor and Statistics identifies the Job Outlook for Data Scientists to increase by 36% (Much faster than average) from 2021 to 2031. (<https://www.bls.gov/ooh/math/data-scientists.htm#tab-1>)

The BLS lists several occupation titles with job duties similar to data scientists that typically require a Bachelor’s or Master’s degree (<https://www.bls.gov/ooh/math/data-scientists.htm#tab-8>).

Occupation	Job Duties	ENTRY-LEVEL EDUCATION	2021 MEDIAN PAY
Actuaries	Actuaries use mathematics, statistics, and financial theory to analyze the economic costs of risk and uncertainty.	Bachelor's degree	\$105,900
Computer and Information Research Scientists	Computer and information research scientists design innovative uses for new and existing computing technology.	Master's degree	\$131,490

Economists	Economists collect and analyze data, research trends, and evaluate economic issues for resources, goods, and services.	Master's degree	\$105,630
Financial Analysts	Financial analysts guide businesses and individuals in decisions about expending money to attain profit.	Bachelor's degree	\$95,570
Market Research Analysts	Market research analysts study market conditions to examine potential sales of a product or service.	Bachelor's degree	\$63,920
Mathematicians and Statisticians	Mathematicians and statisticians analyze data and apply computational techniques to solve problems.	Master's degree	\$96,280
Operations Research Analysts	Operations research analysts use mathematics and logic to help solve complex issues.	Bachelor's degree	\$82,360
Software Developers, Quality Assurance Analysts, and Testers	Software developers design computer applications or programs. Software quality assurance analysts and testers identify problems with applications or programs and report defects.	Bachelor's degree	\$109,020
Survey Researchers	Survey researchers design and conduct surveys and analyze data.	Master's degree	\$59,740

The US Dept. Of Labor's O\*Net Online describes the education requirement for Data Scientists: "Most of these occupations require a four-year bachelor's degree, but some do not." (<https://www.onetonline.org/link/summary/15-2051.00>). Our Program Advisory Council has indicated that employers are eager to provide internships and hire students for entry-level Data Science positions in Data Analytics and Business Intelligence to build and deploy data analytics systems and data visualization dashboards to monitor and analyze employer data.

2. [Present data and analysis projecting market demand and the availability of openings in a job market to be served by the new program.](#)

The Washington-Arlington-Alexandria, DC-VA-MD-WV Metropolitan area ranks 3<sup>rd</sup> (after New York and San Francisco) with the highest employment level in Data Scientists (May 2021). (<https://www.bls.gov/oes/current/oes152051.htm#st>)

In Maryland, Data Science Employment (2018) was 1,140 employees. The Projected employment (2028) of 1,450 employees yields a Projected growth (2018-2028) 27% with Projected annual job openings (2018-2028) of 270. (<https://www.onetonline.org/link/localtrends/15-1221.00?st=MD&g=Go>)

The Southern Maryland region (Charles, St. Mary's and Calvert counties) is projected to experience positive growth in Data Science and related jobs. This growth is driven by the increased understanding of the need for data science knowledgeable employees in every data rich business function. Southern Maryland is the residence of choice for many employees commuting to data centric public sector as well as private sector jobs in the greater Washington DC metro area. Southern Maryland also is the home of the Patuxent Navy Base in St. Mary's County which employs over 17,000 military, civilian, and contractors.

3. Discuss and provide evidence of market surveys that clearly provide quantifiable and reliable data on the educational and training needs and the anticipated number of vacancies expected over the next 5 years.

The Data Science Occupation Overview Lightcast Q3 2022 Data Set (September 2022) indicates a clearly documented persistent and growing need for Data Science training for Data Science employment in the CSM region.

### **Aggressive Job Posting Demand Over a Deep Supply of Regional Jobs**

Jobs (2020)
2,858
Compensation
\$116,642
Job Posting Demand
878

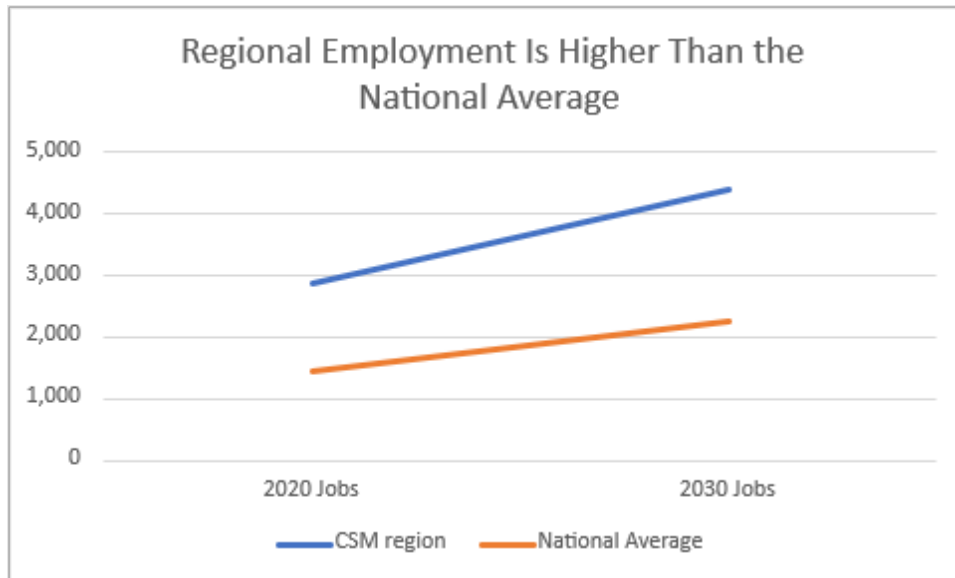
### **Regional Employment Is Higher Than the National Average**

An average area of this size typically has 1,432\* jobs, while there are 2,858 here. This higher than average supply of jobs may make it easier for workers in this field to find employment in your area.

Region	2020 Jobs	2030 Jobs	Change	% Change
CSM region	2,858	4,390	1,533	53.6%
National Average	1,432	2,265	833	58.2%
United States	82,493	136,084	53,590	65.0%

\*National average values are derived by taking the national value for Data Scientists and scaling it down to account for the difference in overall workforce size between the nation and your area. In other words, the values represent the national average adjusted for region size.





## Regional Breakdown

County	2020 Jobs
District of Columbia County, DC	1,036
Fairfax County, VA	952
Arlington County, VA	267
Anne Arundel County, MD	232
Prince George's County, MD	127

## Most Jobs are Found in the Computer Systems Design and Related Services Industry Sector

Jobs	2020 Percent
Computer Systems Design and Related Services	30.1%
Management, Scientific, and Technical Consulting Services	22.4%
Scientific Research and Development Services	5.7%
Management of Companies and Enterprises	5.2%
Architectural, Engineering, and Related Services	3.5%
State Government, Excluding Education and Hospitals	3.0%
Other	30.1%

## Regional Compensation Is 16% Higher Than National Compensation

For Data Scientists, the 2021 median wage in your area is \$116,642, while the national median wage is \$100,922.

## Demand Summary

### Unique Job Postings

28,086

The number of unique postings for this job from Jan 2020 to Aug 2022.

### Employers Competing

4,476

All employers in the region who posted for this job from Jan 2020 to Aug 2022.

### Median Duration

23 Day

Posting duration is 4 days shorter than what's typical in the region.

## Demand

Top Companies	Unique Postings
Booz Allen Hamilton	1,070
Capital One	715
Anthem Blue Cross	513
Guidehouse	498
Deloitte	492
CACI International	385
Leidos	345
SAIC	297
General Dynamics	286
National Geospatial Intelligence Agency	270
Top Job Titles	Unique Postings
Data Scientists	6,219
Data Analysts	4,554
Business Intelligence Analysts	685
Machine Learning Engineers	657
Data Science Managers	371
Principal Data Scientists	357
Business Data Analysts	336
Lead Data Scientists	326
Machine Learning Data Scientists	233
Data Analytics Consultants	212

## Top Specialized Skills

Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Data Analysis	15,945	57%	1,608	46%
Data Science	12,403	44%	2,396	69%
Python (Programming Language)	11,768	42%	1,145	33%
SQL (Programming Language)	11,038	39%	1,040	30%
Machine Learning	8,344	30%	847	24%

R (Programming Language)	8,272	29%	910	26%
Computer Science	8,065	29%	118	3%
Tableau (Business Intelligence Software)	7,555	27%	545	16%
Data Visualization	6,304	22%	467	13%
Statistics	5,435	19%	523	15%

## Top Common Skills

Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	10,465	37%	434	12%
Management	7,696	27%	798	23%
Mathematics	7,417	26%	276	8%
Research	7,093	25%	1,629	47%
Leadership	6,032	21%	758	22%
Operations	5,601	20%	446	13%
Problem Solving	5,370	19%	149	4%
Microsoft Excel	5,048	18%	1,023	29%
Presentations	4,888	17%	319	9%
Detail Oriented	3,866	14%	20	1%

## Top Software Skills

Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Python (Programming Language)	11,768	42%	1,145	33%
SQL (Programming Language)	11,038	39%	1,040	30%
R (Programming Language)	8,272	29%	910	26%
Tableau (Business Intelligence Software)	7,555	27%	545	16%
Microsoft Excel	5,048	18%	1,023	29%
Amazon Web Services	4,073	15%	268	8%
SAS (Software)	3,481	12%	454	13%
Java (Programming Language)	3,433	12%	426	12%
Apache Spark	3,275	12%	216	6%
Microsoft Office	2,798	10%	997	29%

## Retirement Risk Is About Average, While Overall Diversity Is High

Retiring Soon

493

Racial Diversity

1,756

Gender Diversity

1,729

\*National average values are derived by taking the national value for Data Scientists and scaling it down to account for the difference in overall workforce size between the nation and your area. In other words, the values represent the national average adjusted for region size.

## Occupation Age Breakdown

Age	2021 Jobs	2021 Percent
14-18	2	0.0%
19-24	290	8.1%
25-34	1,326	37.1%
35-44	940	26.3%
45-54	527	14.7%
55-64	370	10.3%
65+	123	3.4%

## Occupation Race/Ethnicity Breakdown

Race/Ethnicity	2021 Jobs	2021 Percent
White	1,821	50.9%
Asian	980	27.4%
Black or African American	502	14.0%
Hispanic or Latino	168	4.7%
Two or More Races	101	2.8%
Native Hawaiian or Other Pacific Islander	4	0.1%
American Indian or Alaska Native	2	0.1%

## Occupation Gender Breakdown

Gender	2021 Jobs	2021 Percent
Males	1,848	51.7%
Females	1,729	48.3%

## National Educational Attainment

Education Level	2020 Percent
Less than high school diploma	0.4%
High school diploma or equivalent	2.8%
Some college, no degree	6.9%
Associate's degree	3.8%
Bachelor's degree	37.2%
Master's degree	35.4%
Doctoral or professional degree	13.5%

4. Provide data showing the current and projected supply of prospective graduates.

## Graduate Pipeline Summary

### Programs

9

Of the programs that can train for this job, 9 have produced completions in the last 5 years.

### Completions (2021)

919

The completions from all regional institutions for all degree types.

### Openings (2021)

379

The average number of openings for an occupation in the region is 345.

CIP Code	Top Programs	Completions (2021)
27.0101	Mathematics, General	454
27.0501	Statistics, General	165
27.0305	Financial Mathematics	163
30.3001	Computational Science	96
27.0301	Applied Mathematics, General	19
27.9999	Mathematics and Statistics, Other	18
30.7001	Data Science, General	3
30.7101	Data Analytics, General	1

Top Schools	Completions (2021)
University of Maryland-College Park	321
George Washington University	267
Georgetown University	145
American University	62
United States Naval Academy	41
Howard University	17
St. Mary's College of Maryland	15
The Catholic University of America	13
Anne Arundel Community College	11
Marymount University	7

### D. Reasonableness of Program Duplication:

1. Identify similar programs in the State and/or same geographical area. Discuss similarities and differences between the proposed program and others in the same degree to be awarded.

MHEC's Finding a Major site lists 3 Data Science Certificates and 3 Data Science Associate Degree programs in Maryland.

Institution	Program	Degree
<a href="#">Carroll Community College</a>	<a href="#">DATA SCIENCE</a>	Lower Division Certificate
<a href="#">Harford Community College</a>	<a href="#">DATA SCIENCE</a>	Lower Division Certificate
<a href="#">Montgomery College-All Campuses</a>	<a href="#">DATA SCIENCE</a>	Lower Division Certificate

College of Southern MD	Carroll CC (23) <a href="https://www.carrollcc.edu/programs/degrees-credit-certificates/data-science-certificate/">https://www.carrollcc.edu/programs/degrees-credit-certificates/data-science-certificate/</a>	Harford CC (20) <a href="https://catalog.harford.edu/programs-study-majors/certificates/data-science-certificate/#programrequirementtext">https://catalog.harford.edu/programs-study-majors/certificates/data-science-certificate/#programrequirementtext</a>	Montgomery College (16) <a href="https://catalog.montgomerycollege.edu/previous_program.php?catid=17&amp;poid=4090">https://catalog.montgomerycollege.edu/previous_program.php?catid=17&amp;poid=4090</a>
<b>LOR (9):</b>  CSC -1100 Practical Programming with Python (3)  MTH-1015 Intro to Stats (3)  ITS-2480 Data Analytics (3)			
<b>Certificate (18-19):</b>  CSC -1100 Practical Programming with Python (3)  MTH-1015 Intro to Stats (3)  ITS-2480 Data Analytics (3)  ITS 1055 Introduction to Computing (3)  ITS or MTH Tech Elective (3 or 4)  ITS-2450 Decision Support Systems (3)	<b>Certificate (23):</b>  CIS 105 - Intro to Object-Oriented Programming  DATA 101 - Introduction to Data Science  MATH 115 - Introduction to Statistical Methods  CIS 148 - Intro. to SQL & Database Design  CIA 135 - Excel  CIA 170 - Access  DATA 210 - Exploratory Data Analysis	<b>Certificate (20):</b>  DSCI 101 Introduction to Data Science  CIS 229 Python Programming Language  PHIL 205 Ethics or PHIL 222 Environmental Ethics  DSCI 102 Introductory Statistics with Programming Applications  DSCI 103 Database Management and Database Systems  DSCI 201	<b>Certificate (16):</b>  MATH 117 - Elements of Statistics OR MATH 217 - Biostatistics BSAD 210 - Statistics for Business and Economics  DATA 101 - Introduction to Data  DATA 110 - Data Visualization and Communication  DATA 201 - Statistical Methods in Data Science  DATA 205 - Capstone Experience in Data Science 4 semester hours

		Data Visualization	
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Institution	Program	Degree
<a href="#">Carroll Community College</a>	<a href="#">DATA SCIENCE</a>	Associate Degree
<a href="#">Community College of Balt County</a>	<a href="#">DATA SCIENCE</a>	Associate Degree
<a href="#">Harford Community College</a>	<a href="#">DATA SCIENCE</a>	Associate Degree

CSM: DS AS	Carroll CC: DS AA <a href="https://www.carrollcc.edu/programs/degrees-credit-certificates/data-science-a-a/">https://www.carrollcc.edu/programs/degrees-credit-certificates/data-science-a-a/</a>	CC Baltimore County: DS AS <a href="https://www.ccbcmd.edu/Programs-and-Courses-Finder/program/data-science">https://www.ccbcmd.edu/Programs-and-Courses-Finder/program/data-science</a>	Harford CC: DS AS <a href="https://catalog.harford.edu/programs-study-majors/degrees/datascience-as/#programrequirementstext">https://catalog.harford.edu/programs-study-majors/degrees/datascience-as/#programrequirementstext</a>
<u>Semester 1 (14)</u>  ENG-1010: Composition and Rhetoric  CSC -1100 Practical Programming with Python  MTH-1015: Introduction to Statistics (4)  Biological/Physical Sciences with Lab (4)	<u>Fall</u>  ENGL 101 - College Writing  CIS 105 - Intro to Object-Oriented Programming  CIA 170 - Access  DATA 101 - Introduction to Data Science  Social and Behavioral Science - Diversity Course Required (Select ANTH 101 , SOC 101 , SOC 210 , or SOC 215)	<u>Semester 1</u>  BIOL 110 - Biology I: Molecules and Cells  CMNS 101 - Fundamentals of Communication  CSIT 111 - Logic and OO Design  ENGL 101 - College Composition I  MATH 153 - Introduction to Statistical Methods	<u>First Semester</u>  ENG 101 English Composition  DSCI 101 Introduction to Data Science  CIS 229 Python Programming Language  MATH 203 Calculus  Behavioral/Social Science Elective
<u>Semester 2 (17)</u>  ITS 2480 Data Analytics (CSC 1110 & MTH 1015 prerequisite)  ENG-1020: Composition & Literature  MTH-1200: Calculus I (4)	<u>Spring</u>  CIA 135 - Excel  CIA 170 -	<u>Semester 2</u>  CSIT 142 - Introduction to MIS  CSIT 210 - Introduction to Programming  MATH 163 -	<u>Second Semester</u>  DSCI 102 Introductory Statistics with Programming Applications  DSCI 103 Database Management and Database Systems

Biological/Physical Sciences	Access	Pre-Calculus I	Program Elective
ITS 1055 Introduction to Computing	ENGL 102 - Writing About Literature	MNGT 136 - Business Analytics	Arts/Humanities Elective
Semester 3 (14)	MATH 115 - Introduction to Statistical Methods	PHIL 101 - Introduction to Philosophy	Physical Education Elective
MTH-1210: Calculus II (4)	<u>Fall</u>	<u>Semester 3</u>	<u>Third Semester</u>
CSC-2591: Computer Science I (4)	CIS 148 - Intro. to SQL & Database Design	CHEM 107 or ENVS 101 CSIT 154 - Database Concepts	CSI 131 Computer Science I
MTH-2500: Discrete Mathematics (4)	COMM 105 - Introduction to Speech Communication	CSIT 211 - Advanced Programming	ECON 101 or ECON 102 Macroeconomics or Microeconomics
Communications	Required Arts and Humanities course.	CSIT 251 - Data Visualization	Program Elective
<u>Semester 4 (15-16)</u>	Biological and Physical Sciences General Education	<u>Semester 4</u>	Biological/Physical Lab Science Elective
Tech. Elective: (3-4) ITS 2300 Intro. To Project Management, ITS 2090 Computer Security, ITS 1960 Intro to Linux, ITS 1120 Intro. To Database, or MTH 2210 Calc III	Social and Behavioral Sciences General Education	PSYC 105 - Multicultural Psychology	<u>Fourth Semester</u>
Social/Behavioral Science with Cultural and Global Awareness	Elective.	SOCL 101 - Introduction to Sociology	DSCI 201 Data Visualization
ITS 2450 Decision Support Systems (BAD-1335 OR ITS-1010 OR ITS-1050)	<u>Spring</u>	CSIT 255 - Fundamentals of Data Science	PHIL 205 or PHIL 221 Ethics or Business Ethics
CSC-2592: Computer Science II (4)	DATA 210 - Exploratory Data Analysis	CSIT 260 - Introduction to Machine Learning	Program Elective
Social/Behavioral Sciences	PHIL 105 - Ethics Required Arts and Humanities course.		General Elective
	Biological and Physical Sciences General Education		Biological/Physical Science Elective
	General Education Electives		

	(select 2 courses)		
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All the programs require a course in statistics, introductory programming , database, and at least two data science/analytics/visualization courses

Carroll CC is the only program offered as an Associates of Arts (AA) program while the other programs are Associates of Science (AS). The program uniquely requires three MS Office applications (Excel and Access) courses. These topics are covered in CSM's Decision Support Sytems (Excel and Tableau) and Intro to Database (Access and SQL).

CCBC uniquely includes a third data science class in Machine Learning. This topic is covered in CSM's Data Analytics class.

Harford CC requires Calculus 1 and Computer Science 1 while CSM also requires Calculus 2, Discrete Math as well as Computer Science 2 and a Tech/Math elective which may include Project Management, Intro to Linux, Calculus 3, or Linear Algebra depending on the student's transfer goals.

## 2. [Provide justification for the proposed program.](#)

CSM's Data Science degree program is proposed as an Associates (AS) in order to transfer to BS programs. It is not envisioned as a terminal degree although the coursework robust is enough for Data Science internships and entry-level positions, especially with the expectation to continued study in Data Science to earn a Bachelor's degree.

Typically 4-year Data Science programs reserve most, if not all, of their core data science courses for 300-400 level classes. That forces 100-200 level classes of similar content to transfer as electives.

With that in mind, we propose a Data Science program similar to our community college contemporaries, but with an enough math and computer science coursework to transfer directly to computer science based Data Science programs or provide equivalent rigor at 100-200 level classes to prepare students for success in four year Data Science programs which are typically heavily based on math and computer programming.

CSM's proposed new "stackable" Data Science program includes a 10 credit LOR for a 3 Data Science sequence of Statistics, Python programming and a data science course: Data Analytics. The 18-19 credit Certificate stacks on top of the LOR and adds ITS-1050 Computing Essentials, an ITS or MTH Tech Elective, and a second data science course: Decision Support Systems. The full AS degree stacks on top of the Data Science Certificate and adds (in addition to required General education classes) two semesters of Calculus, Discrete Math, and two semesters of Computer Science.

## E. **Relevance to High-demand Programs at Historically Black Institutions (HBIs)**

### 1. [Discuss the program's potential impact on the implementation or maintenance of high-demand programs at HBI's.](#)

CSM's Data Science program is expected to have a positive impact on the implementation or maintenance of high-demand programs at HBI's by providing a pipeline of potential transfer student candidates.

As of 10/04/2022, three degree programs in Data Science at HBIs in Maryland were listed on MHEC's Finding a Major site:

Coppin State University and Salisbury University have discussed the possibilities of potential transfer opportunities for CSM Data Science students with CSM's Transfer office.

Bowie State University is embarking on a 3 year Data Science & Analytics Initiative but does not have a degree program published yet.

<https://www.bowiestate.edu/academics/colleges/college-of-business/data-science-and-analytics-initiative/>

Morgan State University does not have a program listed yet on MHEC's Finding a Major site.

#### **F. Relevance to the identity of Historically Black Institutions (HBIs)**

1. Discuss the program's potential impact on the uniqueness and institutional identities and missions of HBIs.

CSM's Data Science program is not expected to have a negative impact on the uniqueness and institutional identities and missions of HBIs as CSM fully supports all institutions in their pursuit of access and equity for underrepresented students in Data Science.

#### **G. Adequacy of Curriculum Design, Program Modality, and Related Learning Outcomes** (as outlined in COMAR 13B.02.03.10):

1. Describe how the proposed program was established, and also describe the faculty who will oversee the program.

CSM faculty, administrators and staff (with the guidance of the Technology Department's Program Advisory Council and feedback from area four-year institutions) have conducted the analysis and design research resulting in this proposal for a new Data Science program.

CSM's Data Science A.S. degree program will be overseen by full-time faculty in the Technology Department in collaboration with the Dean of the School of Professional and Technical Studies

2. Describe educational objectives and learning outcomes appropriate to the rigor, breadth, and (modality) of the program.

Students who successfully complete the Associate of Science in Data Science will be able to:

1. Store, process and retrieve data in diverse formats and structures for analysis.
2. Produce and interpret numerical summaries and data visualizations to explore and communicate insights from analysis.
3. Establish a foundation in modeling diverse datasets to describe and test relationships among variables.
4. Develop proficiency with computer programming code to model data for experiment and analysis.
5. Examine and explain ethical and moral issues impacting society in the field of data science.

3. Explain how the institution will:

a) provide for assessment of student achievement of learning outcomes in the program

CSM's Academic Planning and Assessment's office's Student Learning Outcomes Assessment Plan (SLOAP) outlines the process of collecting information to determine whether CSM's academic offerings are having the appropriate educational impact on students. Student Learning Outcomes Assessment (SLOA) is defined as the systematic collection of information about academic offerings and analysis thereof, for the purpose of improving student learning.

The following recommended sequence of course completion demonstrates how the courses will achieve the Data Science program learning outcomes:

Data Science Program Courses	Data Science Program LOs
CSC -1100 Practical Programming with Python	1, 2, 3, 4, 5
CSC-2591: Computer Science I	1, 4
CSC-2592: Computer Science II	1, 4
ITS 1055 Introduction to Computing	1, 2
ITS 2450 Decision Support Systems	1, 2, 3, 4, 5
ITS 2480 Data Analytics	1, 2, 3, 4, 5
MTH-1015: Introduction to Statistics	2, 3
MTH-1200: Calculus I	2, 3
MTH-1210: Calculus II	2, 3
MTH-2500: Discrete Mathematics	2, 3
Tech. Elective:	
ITS 1120 Intro. To Database	1, 2, 3, 4,5
ITS 1960 Intro to Linux	1, 4
ITS 2090 Computer Security	1, 5
ITS 2300 Intro. To Project Management	2, 5
MTH 2210 Calc III	2, 3, 4
MTH 2210 Linear Algebra	2, 3, 4

b) document student achievement of learning outcomes in the program

Program Assessment at CSM is a cyclical process that includes:

1. Program Reviews conducted every five-six years, or more often as needed.
2. Academic certificate programs are included within the review of degree programs.
3. Program Monitoring conducted every other year (except in the year of a Program Review).
4. Program Assessments of Student Learning conducted on a cycle established by faculty.

In addition, CSM conducts course evaluations every semester or, more often when deemed necessary

4. Provide a list of courses with title, semester credit hours and course descriptions, along with a description of program requirements

CSC-1100 – Practical Programming with Python\* (3)

*New course using SAIL() curriculum and replacing CSC-1110*

Prerequisite: MTH-0992 or higher

Students learn the concepts, techniques, skills, and tools needed for developing programs in Python. Core topics include types, variables, functions, iteration, conditionals, data structures, classes, objects, modules, and I/O operations. Students get an introductory experience with several development environments, including Jupyter Notebook, as well as selected software development practices, such as test-driven development, debugging, and style. Course projects include real-life applications on enterprise data and document manipulation, web scraping, and data analysis.

CSC-2591 - Computer Science I\* (4)

Prerequisite: CSC 1110 or EGR 1100

This first course in object oriented programming provides a comprehensive introduction to the fundamentals of object oriented program design (overloading, data abstraction, inheritance and polymorphism), debugging, and testing. The students learn the concepts of modular object oriented program and algorithm design via various projects throughout the semester. File processing, array manipulation, and elementary searching (sequential and binary) and sorting (selection, insertion, merge) algorithms are introduced. ITS-2591 is now CSC-2591.

CSC-2592 - Computer Science II\* (4)

Prerequisite: CSC-2591

This course builds on the first course training students to better employ advanced data-structures (two dimensional arrays, linked lists, stacks, queues, trees, heaps, priority queues, sets and maps) and algorithms (hashing, quick-sort, heap-sort) to large programming projects. Students learn how to manipulate various data-structures: traversal, insertion, and deletion. Efficiency of various data-structures is explored via worst and average-case time and space analysis. ITS-2592 is now CSC-2592.

### ITS-1055 – Introduction to Computing\* (3)

*New course using SAIL() curriculum and replacing ITS-1050*

Students learn what computing is and what role it plays as well as the concepts, techniques, skills and tools needed for operating and managing computers in both personal and enterprise environments. Students will be able to identify the role computing plays in a modern society in areas such as data analysis, automation, or Internet of Things (IoT). Topics include computing devices, operating systems, data representation, filesystems, networking, Internet, cloud services, Cybersecurity, database systems, computer programming and troubleshooting.

### ITS-2450 - Decision Support Systems\* (3)

Prerequisite: BAD 1335 or ITS 1010 or ITS 1050

Students learn the basic concepts of decision support systems. Topics include: building and implementing a decision support system utilizing Microsoft Excel, scenario management, what-if analysis, and the use of the Excel Solver tool. Heavy emphasis is placed on using decision support systems for business decisions. Business application development techniques are applied to aid in the development of complex decision support systems.

### ITS-2480 - Data Analytics\* (3)

Prerequisite: CSC-1110; MTH-1015

The emergence of new data sources is transforming the role of the data analyst from one who simply reports information to one who is charged with making sense of the available data and distilling it for a given audience. This course emphasizes fundamental coursework on the standards and practices for collecting, organizing, managing, exploring, and using data. Topics include preparation, analysis, and visualization of data and creating analysis tools for larger data sets.

### MTH-1015 - Introduction to Statistics\* (M) (3)

Prerequisite: MTH-0994 or MTH-0940 or MTH-0970

In this introduction to descriptive and inferential statistics, students learn about presentation of data, measures of central tendency and dispersion, the binomial and normal probability distributions, sampling techniques, correlation and regression, and hypothesis testing (z-test, t-test, chi-squared). Examples are selected from education, business, and the social and natural sciences. This course satisfies the General Education Mathematics requirement. MTH-2300 is now MTH-1015.

### MTH-1200 - Calculus I and Analytic Geometry\* (M) (4)

Prerequisite: MTH 1150; or MTH 1120 and MTH 1130

This first course in the calculus sequence is intended for students in the fields of mathematics, engineering, and the physical and life sciences. Topics include limits, continuity, derivatives, basic differential equations, parametric equations, indefinite and definite integration. Differential calculus applications include L'Hopitals Rule, curve sketching, optimization,

Newton's Method, and rate problems, and integral calculus applications include areas of regions. This course satisfies the General Education Mathematics requirement.

MTH-1210 - Calculus II\* (M) (4)

Prerequisite: MTH 1200

This continuation of MTH 1200 includes integral applications such as volumes of solids, arc length, moments and centers of mass, areas of surfaces of revolution, work done by a variable force, fluid pressures and forces. Also introduced are transcendental functions, techniques of integration including numerical integration and improper integrals, sequences and series and their applications in differential and integral calculus, conic sections and polar coordinates. This course satisfies the General Education Mathematics requirement.

MTH-2500 - Introduction to Discrete Math\* (3)

Prerequisite: MTH-1200

Students will work as individuals and in small teams to explain and apply the basic methods of discrete (noncontinuous) mathematics in computer science and use these methods in subsequent courses in the design and analysis of algorithms, computability theory, software engineering, and computer systems. Students will reason mathematically about basic data types and structures such as numbers, sets, graphs and trees used in computer algorithms and systems. Rigorous definitions and conclusions from merely plausible ones are distinguished. Computational processes are modeled and analyzed using analytic and combinatorial methods. Applications include principles of discrete probability to calculate probabilities and expectations of simple random processes.

Tech Electives (Choose 1)

ITS-1120 - Introduction to Database\* (3)

Prerequisite: ITS 1050 or ITS 1020

Students learn how to use a relational Database Management Systems (DBMS). Topics include building, modifying, implementing, management and administration of a relational DBMS using Microsoft Access. Students will learn how to create tables, queries, forms, reports, and relationships according to project requirements. This course uses lecture and a hands-on format.

ITS-1960 - Introduction to Linux\* (3)

Prerequisite: ITS-1020 or ITS-1050

Students learn the basic concepts of the Linux operating system as it relates to computer hardware, software, and operations, including command syntax, file management and maintenance, and troubleshooting of user problems. For students who plan to use personal computers, this course may have specific computing requirements. Please refer to the Quick Link for Computing Requirements on the Business, Technology, and Public Service website.

ITS-2090 - Computer Security\* (3)

Prerequisite: ITS 1050

ITS-2090 covers the fundamentals of operational security, network security, managing a public key infrastructure (PKI), authentication, access control, external attack, and cryptography. Students learn about the security procedures to protect data in computer environments, the different network attack scenarios, the many tools and procedures used by organizations to protect their resources, and the ethical issues raised by computer security in the business world. This course helps prepare students for the CompTIA Security+ exam. The vendor neutral CompTIA Security+ certification is the acceptable industry-level security certification. For students who plan to use personal computers, this course may have specific computing requirements. Please refer to the Quick Link for Computing Requirements on the Business, Technology, and Public Service website.

ITS-2300 - Introduction to Project Management\* (3)

Co-requisite: Co-requisite: ITS 1010 or ITS 1050 or BAD 1335

This course has been recommended by business leaders all over Southern Maryland. Students will be introduced to the concept of project management and will investigate key elements of the project management framework. Specific knowledge in several of the project management knowledge areas such as project scope, project time, project cost and project quality management will be covered. Students will sample several popular project management software packages in order to compare their features.

MTH-2210 - Differential Equations\* (4)

Prerequisite: MTH-1210

Students learn to solve ordinary first order, higher order linear, and systems of differential equations. Matrix theory along with the eigenvalue problem is covered to provide a matrix approach to solving systems of differential equations. The Laplace Transform as an integral transform is defined and applied. Students apply their knowledge to problems of rate, falling bodies, growth and decay, cooling, series and simple harmonic motion. Some topics are supported by computer software.

MTH-2220 - Introduction to Linear Algebra\* (4)

Prerequisite: MTH-1210

Students study systems of linear equations, matrices, and determinants, as well as finite dimensional vector spaces, inner product spaces, linear transformations, eigenvalues, and eigenvectors. Applications include curve fitting, network analysis, Cramer's rule, and differential equations. Some topics are supported by computer software.

Recommended Course Sequence

<b>Semester 1</b>
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<b>College of Southern Maryland</b>	<b>Credits</b>	<b>Gen Ed</b>	<b>Minimum Grade</b>
ENG-1010: Composition and Rhetoric	3	E	C
CSC-1100: Program Design and Development	3		
MTH-1015: Introduction to Statistics	3	M	
Biological/Physical Sciences with Lab	4	S	
	13		

<b>Semester 2</b>			
<b>College of Southern Maryland</b>	<b>Credits</b>	<b>Gen Ed</b>	<b>Minimum Grade</b>
ITS 2480 Data Analytics	3		
ENG-1020: Composition & Literature	3	H	
MTH-1200: Calculus I	4	M	
Biological/Physical Sciences	3	S	
ITS-1055 – Introduction to Computing	3		
	16		

<b>Semester 3</b>			
<b>College of Southern Maryland</b>	<b>Credits</b>	<b>Gen Ed</b>	<b>Minimum Grade</b>
MTH-1210: Calculus II	4	M	
CSC-2591: Computer Science I	4		
MTH-2500: Discrete Mathematics	4		

Communications	3	H	
	15		

Semester 4			
College of Southern Maryland	Credits	Gen Ed	Minimum Grade
Tech. Elective: ITS 2300 Intro. To Project Management, ITS 2090 Computer Security, ITS 1960 Intro to Linux, ITS 1120 Intro. To Database, or MTH 2210 Calc III, MTH-2220 - Introduction to Linear Algebra	3-4		
Social/Behavioral Science with Cultural and Global Awareness	3	B	
ITS 2450 Decision Support Systems	3		
CSC-2592: Computer Science II	4		
Social/Behavioral Sciences	3	B	
	16-17		

5. Discuss how general education requirements will be met, if applicable.

MHEC requires a minimum of 18 credits in General Education.

CSM's proposed Data Science program has 34 credits required, as listed below.

Semester 1			
College of Southern Maryland	Credits	Gen Ed	Minimum Grade
ENG-1010: Composition and Rhetoric	3	E	C
MTH-1015: Introduction to Statistics	3	M	
Biological/Physical Sciences with Lab	4	S	
	10		

Semester 2			
College of Southern Maryland	Credits	Gen Ed	Minimum Grade

ENG-1020: Composition & Literature	3	H	
MTH-1200: Calculus I	4	M	
Biological/Physical Sciences	3	S	
	10		

Semester 3			
College of Southern Maryland	Credits	Gen Ed	Minimum Grade
MTH-1210: Calculus II	4	M	
Communications	3	H	
	7		

Semester 4			
College of Southern Maryland	Credits	Gen Ed	Minimum Grade
Social/Behavioral Science with Cultural and Global Awareness	3	B	
Social/Behavioral Sciences	3	B	
	6		

6. Identify any specialized accreditation or graduate certification requirements for this program and its students.

There are no specialized graduate certification requirements for this program and its students.

7. If contracting with another institution or non-collegiate organization, provide a copy of the written contract.

There is no contract with another institution or non-collegiate organization.

8. Provide assurance and any appropriate evidence that the proposed program will provide students with clear, complete, and timely information on the curriculum, course and degree requirements, nature of faculty/student interaction, assumptions about technology competence and skills, technical equipment requirements, learning management system,

availability of academic support services and financial aid resources, and costs and payment policies.

CSM provides information to students about our program offerings in numerous ways, including Campus Open Houses and Tours, Presentations at local high schools, Orientation and Registration sessions, and New Student Welcome events. They are provided with information about applying to CSM, college readiness, financial aid, payment policies, technical requirements, including our LMS, and the many academic support services.

Advisors are available in-person and through videoconferencing sessions. We also have a faculty advising training program to equip faculty to advise students after they have completed 30 credits towards their degree.

Other student services include learning support services such as tutoring, workshops, and learning labs, library services, counseling services, testing services on all campuses, and disability, and Veteran & Military support services.

Students are provided with a CSM email account and access to Microsoft Office software with information about our technology services support and help desk.

Our students are notified in writing of changes that may impact their program planning. Because the new elective offerings are courses that are already being offered, we do not anticipate any major challenges in implementing the proposed changes

9. Provide assurance and any appropriate evidence that advertising, recruiting, and admissions materials will clearly and accurately represent the proposed program and the services available.

Our Admissions Department works closely with the Marketing Department and the Division of Academic Affairs to ensure that the recruitment and admissions materials will clearly and accurately represent our programs and services available. The Admissions Department identifies prospective students; recruits and admits new students; and provides information regarding the college to all prospective and current students and the community. The department works collaboratively with the Enrollment Management Team to support the college's efforts to attract students and assist them in defining and achieving their goals and in providing the highest quality customer service.

The goal of the Recruitment Team is to attract traditional and returning adults to the college through several avenues that include presentations to middle and high schools, civic organizations, businesses, alternative schools, college fairs and information sessions. In addition, the team is responsible for post-test advising for new students in order to ensure a smooth transition into the college community. Team members are available to meet with anyone interested in learning more about the college and how it can help them realize their potential.

As the focal point of college information, the Call Center staff responds to questions on how to start the college application process, provides assistance with log-in and account restrictions, and answers many general questions about the college.

As a team, our Marketing Department completes more than 500 projects each year to support and promote the many programs and initiatives at CSM. The team provides website support and is responsible for accurately representing all of our programs and services available at CSM.

## H. Adequacy of Articulation



1. If applicable, discuss how the program supports articulation with programs at partner institutions. Provide all relevant articulation agreements.

CSM has worked with University of Maryland Global Campus (UMGC) to draft a transfer plan with the new Data Science AS degree program. CSM has also worked with Coppin State University to draft a transfer agreement. These draft documents are included with this program proposal.

Additionally, CSM is in the process of working with Capitol Technology University and Coppin State to develop transfer agreements for the new Data Science AS degree program.

The curriculum for CSM's Data Science program is based on a broad and rigorous foundation of Math, Computer Science and Technology classes. Based on the feedback we have received from four-year institutions so far; we are hopeful that CSM students will be able to transfer into the Data Science programs at several Maryland schools.

### University of Maryland Global Campus (UMGC):

 <b>CSM ASSOCIATE OF SCIENCE IN DATA SCIENCE</b>		 <b>CATALOG YEAR: 2022-2023</b>
Students transferring from CSM with a conferred Associate of Arts or Associate of Science degree will		<a href="http://www.umgc.edu/transfers-and-credits/community-college-alliances/maryland-community-college-">http://www.umgc.edu/transfers-and-credits/community-college-alliances/maryland-community-college-</a>
<b>CREDITS</b>	<b>COLLEGE OF SOUTHERN MARYLAND Requirements for Associate's Degree</b>	<b>UNIVERSITY OF MARYLAND GLOBAL CAMPUS Requirements for Bachelor's Degree</b>
3	ENG 1010 Gen Ed requirement ( <i>completed with 'C' or better</i> )	WRTG 112 (Gen Ed Communications)
3	CSC 1110 Program requirement	CMIS 102 (elective)
4	MTH 1015 Gen Ed requirement	◆ STAT 200 Introduction to Statistics (required for the major)
4	Biological/Physical Lab Sciences Gen Ed requirement	Gen Ed Biological & Physical Lab Science
3	ITS 2480 Program requirement	DATA 220 (Gen Ed Computing; related req to major; prereq to DATA 300)
3	ENG 1020 Gen Ed requirement	ENGL 102 (Gen Ed Communications)
4	MTH 1200 Gen Ed requirement	MATH 140 (Gen Ed Mathematics; related requirement to the major)
3	Biological/Physical Sciences Gen Ed requirement	Gen Ed Biological & Physical Science

3	ITS 1050 Program requirement	CMIT 202 (elective)
4	MTH 1210 Program requirement	MATH 141 (elective)
4	CSC 2591 Program requirement	CMIS 141 (elective)
3	MTH 2500 Program requirement	CMSC 150 (Gen Ed Arts & Humanities to honor Gen Ed block)
3	Communications Gen Ed requirement	Gen Ed Communications
3-4	ITS 2300, 2090, 1960, 1120, or MTH 2210 Technical elective	BMGT 487*, CMIT 320*, CMIT 291, CMIS elective, MATH 246 (elective)
3	Social/Behavioral Sci Cultural & Global Awareness Gen Ed req	Gen Ed Behavioral & Social Science
3	ITS 2450 Program requirement	IFSM elective (Gen Ed Arts & Humanities to honor Gen Ed block)
4	CSC 2592 Program requirement	CMIS 242 (elective)
3	Social/Behavioral Science Gen Ed requirement	Gen Ed Behavioral & Social Science
<b>60-61</b>	<b>Total Credits Transferred</b>	
<b>REMAINING UMGC DEGREE REQUIREMENT RECOMMENDED SEQUENCE UPON TRANSFER WITH ASSOCIATE'S DEGREE</b>		
LIBS 150 Introduction to Research or other Gen Ed course (will be fulfilled with 1 credit of CSC 2591 from CSM )		---
PACE 111T Program and Career Exploration in Technology or other PACE 111		3
◆ DATA 300 Foundations of Data Science (required for the major)		3UL
Elective		3
◆ CSIA 300 Cybersecurity for Leaders and Managers (required for the major)		3UL
Elective		3
◆ DATA 320 Introduction to Data Analytics (required for the major)		3UL
◆ IFSM 330 Business Intelligence and Data Analytics (required for the major)		3UL
Elective		3
◆ DATA 335 Data Visualization (required for the major)		3UL
WRTG 393 Advanced Technical Writing or any other upper-level writing (Gen Ed Communications)		3UL
◆ DATA 430 Foundations of Machine Learning (required for the major)		3UL
◆ DATA 440 Advanced Machine Learning (required for the major)		3UL
Elective		3
◆ DATA 445 Advanced Data Science (required for the major)		3UL
Elective		3
◆ DATA 450 Data Ethics (required for the major)		3UL
◆ DATA 460 Artificial Intelligence Solutions (required for the major)		3UL
Elective		3
◆ DATA 495 Data Science Capstone (required capstone for the major)		3UL
Elective		2-3
<b>TOTAL CREDITS REMAINING AT UMGC</b>		<b>59-60</b>
<b>NOTES:</b> Minimum of 120 credits, including 36 upper-level (courses numbered 300-499) required for bachelor's degree with minimum 2.0 (C) grade point average (GPA) / No course within major or minor below 2.0 GPA / At least one-half of credits within major and minor comprised of: a. upper-level; b. UMGC resident; c. traditional college courses earning a grade / Maximum of 70 transfer credits to UMGC from 2-year or community college (actual number of transfer credits dependent on meeting all UMGC bachelor's degree requirements) / WRTG 112 completed with grade of 1.67 GPA (C-) or better / ◆ = Denotes course in major at UMGC / * = Denotes lower-level course meets content requirement of upper-level course but does not transfer as upper-level / UL = Denotes upper-level course		

## **Capitol Technology University (CTU):**

**Agreement between College of Southern Maryland (CSM) and Capitol Technology University (Capitol Tech) for the Articulation of the following Associate of Science in Data Science at College of Southern Maryland (CSM) to the following B.S. degrees at Capitol Tech: Bachelor of Science in Data Science**

### **PURPOSE**

This agreement facilitates the transfer of CSM students who graduate with Associate of Science in Data Science to the B.S. in Data Science at Capitol Tech. This agreement defines the terms of the transfer agreement.

The goals inherent in the agreement are to:

1. Facilitate student admission into the B.S. in Data Science after completing the Associate of Science in Data Science.
2. Establish a clear set of understandings and expectations for institutions, students, and their respective degrees.
3. Establish a pathway for CSM Associate of Science in Data Science graduates to earn a B. S. degree in Data Science at Capitol Tech to advance their careers in the associated field.

### **ARTICULATION AGREEMENT**

CSM and Capitol Tech agree that students from CSM, under the articulation agreement, may transfer credits earned for the Associate of Science in Data Science towards a B. S. degree in Data Science at Capitol Tech. The following general principles guide the implementation of this agreement:

1. The program is designed for graduates of the Associate of Science in Data Science at CSM to transfer specific courses in which they have earned the grade of C or higher. The number of courses transferred may not exceed 70 credit hours. However, students with transfer credits from 4-year institutions may request evaluation of those credits for additional transfer. The credit hours transferred from CSM contribute to the fulfillment of the 120/121 credit hours required for baccalaureate completion at Capitol Tech.
2. The course transfer tables included with this document specifies courses that may transfer from CSM to Capitol Tech.
3. Capitol will consider, on a case-by-case basis, accepting credit from non-direct classroom instruction (including CLEP, AP, and other nationally recognized standardized examination scores).
4. Students are advised to complete the A.S. degree prior to officially transferring to Capitol Tech.
5. CSM students who complete the Associate of Science in Data Science with a 2.5 grade point average will be automatically accepted into the B.S. in Data Science degree program at Capitol Tech.
6. Students who complete the associates degree with a GPA of 3.0 or higher and subsequently attend Capitol in either an on campus or synchronous online program full-time will receive transfer scholarships of up to \$10,000 per year.
7. Students who transfer to Capitol's asynchronous eight-week term programs will qualify for the partner tuition rate (\$360 per credit hour for 2020-2021)
8. At the request of CSM, Capitol Tech will provide general information on the academic progress

of CSM students enrolled in any of the Capitol Tech's B.S. programs. Any feedback must adhere to FERPA requirements.

9. The Capitol Tech BS in Construction Safety is a Board of Certified Safety Professionals (BCPS) QAP program. Upon graduation, graduates of a BCPS QAP program like this are eligible to apply for the Graduate Safety Practitioner® (GSP®), a BCSP-approved credential necessary to apply for the Certified Safety Professional® (CSP®). In order for Capitol Tech to obtain this status, all the safety, math, and science courses we offer in this program include their mandatory criteria.
10. CSM and Capitol Tech agree to monitor the performance of this agreement when any changes to program curriculum occur.
11. CSM and Capitol Tech agree to publicize this agreement on their web sites.
12. The course transfer tables are subject to a five-year review for updating and revising as necessary by the appropriate CSM and Capitol Tech officials without affecting the signed agreement.
13. Either party may terminate the agreement with 60 days advance written notice to the other. Termination of the agreement will not affect any students currently enrolled in the Associate of Science in Data Science who are taking courses at Capitol or who are accepted into the Data Science at Capitol Tech.
14. This agreement becomes effective on the date that the last authorizing party has signed the agreement. The last signer will write the date on the signature page.

#### Course Requirements for

### **BACHELOR OF SCIENCE in DATA SCIENCE Degree**

Bachelor of Science (122 Credits)

<b>COURSE NUMBER, TITLE and NUMBER of CREDITS</b>			<b>COURSE NUMBER, TITLE and NUMBER of CREDITS</b>		
<b>Business Management</b>			<b>Analytics</b>		
<b>33 Credits</b>			<b>42 Credits</b>		
	BUS-270 Financial Accounting (3)			CS-120 Intro to Programming Using Python (3)	CSC-1110
	BUS-275 Human Resource Management (3)			CS-150 Programming in C (3)	
	BUS-279 Introduction to Leadership (3)			BUS-101 Introduction to Data Science (3)	
	BUS-289 Entrepreneurship & Small Business Management (3)			CS-220 Database Management (3)	ITS-1120
	BUS-301 Project Management (3)			CS-240 Introduction to Data Mining (3)	
	BUS-358 Internship (3)			BUS-240 Statistical Methods in Data Science (3)	
	BUS-378 Legal Environment of Business (3)			BUS-245 Writing and Communication in Data Science (3)	
	BUS-386 Organizational Theory/Behavior (3)			BUS-284 Data Identification & Collection Strategies (3)	ITS-2480
	BUS-410 Strategic Management (3)			BUS 310 Data Mining for Effective Decision Making (3)	
	CS-457 Senior Design Project I (3)			CS-350 Data Visualization (3)	
	CS-458 Senior Design Project II (3)			CS-360 Text Mining and Natural Language Processing (3)	

				CS-370 Computer Vision (3)	
				BUS-443 Marketing Analytics: Decision Making in the Information Age (3)	
				CS-440 Advanced Machine Learning (3)	
			<b>Electives</b>		<b>6 Credits</b>
				1. Elective	ITS-1050
<b>Mathematics &amp; Science</b>		<b>20 Credits</b>			
	MA-112 Intermediate Algebra (3)	*	<b>Humanities &amp; Social Sciences</b>		<b>21 Credits</b>
	MA-114 Algebra & Trigonometry (4)	*		BUS-174 Intro to Business and Management (3)	
	MA-128 Statistics (3)	MTH-1015		EN-101 English Communications I (3)	ENG-1010
	MA-261 Calculus I (4)	MTH-1200		EN-102 English Communications II (3)	ENG-1020
	BUS-247 Quantitative Methods for Business Analytics (3)			HU-331 OR HU-332 Arts and Ideas (3)	
	Science Elective (3)	Biological/ Physical Sciences		Humanities Elective (3)	Communications
<b>Evaluated by (list below):</b>		<b>Date:</b>		SS-351 Ethics (3)	
1.				Social Science Elective (3)	Social/Behavioral Science
2.			<b>Schools transferred in from:</b> <div style="display: flex; justify-content: space-between;"> <span>T1</span> <span>T3</span> </div> <div style="display: flex; justify-content: space-between;"> <span>=</span> <span>=</span> </div> <div style="display: flex; justify-content: space-between;"> <span>T2</span> <span>T4</span> </div> <div style="display: flex; justify-content: space-between;"> <span>=</span> <span>=</span> </div>		
3.					
<b>Student's First Name:</b>		<b>Initial:</b>	<b>Comments: * Elective credit will be used in place of these courses: Biological/Physical Sciences with Lab and MTH-1210</b>		
<b>Student's Last Name:</b>					

Students are required to complete FS-100 (Freshman Seminar) unless the student has transferred 24 credit hours or greater. A student may be required to complete MA-005, and/or EN-001, and/or CS-100 based on placement test results.

**Coppin State University (CSU):**

ATTACHMENT A to Articulation Agreement between COLLEGE OF SOUTHERN MARYLAND and CSU re: **AS**  
**in Data Science to BS in Data Science**

**INCLUDE COURSE OUTLINE HERE****Year One – College of Southern Maryland**

<b>Fall Semester</b>	<b>Cr</b>
ENG-1010 - Composition and Rhetoric* (E)	3
CSC-1110 - Program Design and Development*	3
MTH-1015 - Introduction to Statistics* (M)	4
Biological/Physical Sciences with Lab (S)	4
<b>Total Credits</b>	<b>14</b>

(Courses may be taken in any order)

<b>Spring Semester</b>	<b>Cr</b>
ITS-2480 - Data Analytics*	3
ENG-1020 - Composition & Literature* (H)	3
MTH-1200 - Calculus I* (M)	4
Biological/Physical Sciences (S)	3
ITS-1050 - Computing Essentials*	3
<b>Total Credits</b>	<b>16</b>

**Year Two – College of Southern Maryland**

<b>Fall Semester</b>	<b>Cr</b>
MTH-1210 - Calculus II* (M)	3
CSC-2591 - Computer Science I*	4
MTH-2500 - Discrete Mathematics*	4
Communications (H)	3
<b>Total Credits</b>	<b>14</b>

<b>Spring Semester</b>	<b>Cr</b>
ITS-2300 - Intro. To Project Management* ITS-2090 - Computer Security* ITS-1960 - Introduction to Linux* ITS-1120 - Introduction to Database* MTH-2200 - Calculus III*	3
Social/Behavioral Science with Cultural and Global Awareness (B)	3
ITS-2450 - Decision Support Systems* (BAD-1335 OR ITS-1010 OR ITS-1050)	3
CSC-2592 - Computer Science II*	4
Social/Behavioral Sciences (B)	3
<b>Total Credits</b>	<b>16</b>

***Apply to graduate from College of Southern Maryland with an Associate of Science in Data Science***

\* Courses requiring a prerequisite or co-requisite

Course Indicators: English Composition (E), Arts (A), Cultural and Global Awareness (C), Humanities (H), Biological/Physical Sciences (S), Social/Behavioral Sciences (B), Mathematics (M)

### Year Three – Coppin State University

Fall Semester		Cr
ACCT-201 - Principle of Financial Accounting		3
ECON-211 – Principle of Economics I		3
FINM-330 - Business Finance		3
MKTG-310 - Principles of Marketing		3
BDSC-340 - Operations Management		3
<b>Total Credits</b>		<b>15</b>

Spring Semester		Cr
ACCT-202 - Principle of Managerial Accounting		3
ECON-212 – Principle of Economics II		3
DSCI-351 - Data Visualization		3
DSCI-355 – Data and Text Mining		3
MISY-341 - Small Systems Software		3
<b>Total Credits</b>		<b>15</b>

### Year Four – Coppin State University

Fall Semester		Cr
BUSI-310- Business Law		3
MGMT-320 - Principles of Management		3
MGMT-305 - Business Communications		3
DSCI-375 - Time Series Modeling and Forecasting		3
DSCI-420 – Machine Learning		3
<b>Total Credits</b>		<b>15</b>

Spring Semester		Cr
BUSI-320 - Fundamental of International Business		3
DSCI-356 - Data Science Cloud Computing		3
MISY-360 – Database Management Principles		3
DSCI-490 - Data-driven Decision Making		3
BUSI-495 - Seminar: Bus. Strategy & Policy		3
<b>Total Credits</b>		<b>15</b>

### College of Southern Maryland and Coppin State University Draft Articulation for AS in Data Science and BS in Data Science

Course Outline					
College of Southern Maryland			Coppin State University		
Course	Description	Credits	Course Equivalency	Description	Credits
ENG-1010	Composition and Rhetoric (E)	3	ENGL 101	English Composition I	3
CSC-1110	Program Design and Development	3	General Elective		3

Course Outline					
College of Southern Maryland			Coppin State University		
MTH-1015	Introduction to Statistics	4	BDSC 322	Business Statistics	3
	Biological/Physical Sciences with Lab	4	BIOL 101/ PHSC 101	Biology/Physical Science	4
ITS-2480	Data Analytics	3	DSCI 201	Introduction to Data Science	3
ENG-1020	Composition & Literature	3	ENGL102	English Composition II	3
MTH-1200	Calculus I	3	MATH 131	College Algebra	3
	Biological/Physical Sciences	3	PHSC 103	Environmental Sciences	3
ITS-1050	Computing Essentials	3	MISY 150	Tech Fluency	3
MTH-1210	Calculus II	3	General Elective		3
CSC-2591	Computer Science I	4	DSCI 310	Data Science Programming	3
MTH-2500	Discrete Mathematics	4	DSCI 450	Special Topics in Data Science	3
	Communications	3	SPCH 105	Introduction to Speech Communication	3
ITS 2300 ITS 2090 ITS 1960 ITS 1120 MTH 2200	Tech. Elective:  Intro. To Project Management Computer Security Intro to Linux Intro. To Database Calc III	3-4	General Elective		3
	Social/Behavioral Science with Cultural and Global Awareness	3	Social and Behavioral Sciences		3
ITS 2450	Decision Support Systems	3	MISY 422	Decision Support Systems	3
CSC-2592	Computer Science II	4	General Elective		3
	Social/Behavioral Sciences	3	Social and Behavioral Sciences		3

**I. Adequacy of Faculty Resources** (as outlined in COMAR 13B.02.03.11).

1. Provide a brief narrative demonstrating the quality of program faculty. Include a summary list of faculty with appointment type, terminal degree title and field, academic title/rank, status (full-time, part-time, adjunct) and the course(s) each faculty member will teach in the proposed program.

CSM's Technology Department employs highly qualified faculty who have earned appropriate academic credentials and/or certifications in the disciplines they teach or in overlapping technical disciplines directly related to the emerging field of data science.

Faculty	Degree	Rank / Status	Courses
Dr. Eugen Leontie	PhD in Computer Science	Associate Professor of Computer Science /Full Time	CSC 1100, CSC 2591, CSC 2592
Dr. Gale Pomper	Doctorate of Science in Information Assurance, ISC CISSP certification, CompTIA Server+ certification, CompTIA Security+ certification, ISC ISSEP certification	Instructor of Cybersecurity and Computer Science /Full Time	ITS 2090, ITS 1960
Joe Burgin	BA + 18 graduate credits towards MS Data Analytics GA Tech + 21 graduate credits Applied Linguistics U. Texas, and PCEP, PCAP, CLE certifications	Professor of Technology /Full Time	CSC 1100, ITS 1120, ITS 2450, ITS 2480
Ronda Jacobs	MA Education, Adult Education and Distance Learning, AWS Solutions Architect certification	Associate Professor of Technology /Full Time	ITS 1055
Lakisha Ferebee	MS in Cybersecurity Technology, CompTIA Security+ certification	Assistant Professor of Cybersecurity /Full Time	ITS 1055 ITS 2090
Dr. Tracy Hamm-Simmons	PhD in Business Admin. - Specialty in Project Management, MS in Information technology – Specialty in Project Management, Certified Scrum Master certification, Project management Professional (PMP) certification, Agile Certified Practitioner certificate,	Adjunct Instructor and Director of Program and Project Management /Part Time	ITS 2300

	Federal Acquisition Certification for Program and Project Managers (FAC-P/PM)		
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2. Demonstrate how the institution will provide ongoing pedagogy training for faculty in evidenced-based best practices, including training in:
  - a) Pedagogy that meets the needs of the students
  - b) The learning management system
  - c) Evidenced-based best practices for distance education, if distance education is offered.

The Data Science program faculty will be drawn from the Technology Department comprised of both full-time and part-time faculty and come from diverse professional and academic backgrounds. Our full-time faculty includes both new instructors as well as long-time tenured faculty with academic credentials in the fields of computer science, cyber security, cloud and information technology as well as data science. Some of our full-time faculty have relevant industry experience in these technical fields as well.

Our adjunct faculty are current or former practitioners in computer science, cyber security, cloud and information technology as well as data science, and they come with a great deal of relevant expertise to enrich their teaching and benefit our students.

Our Distance Learning and Faculty Development (DLF) division provides support to faculty in training and administration of our learning management system (LMS). All new faculty are required to complete LMS training. Other training courses are also available to all faculty, including training on teaching web-hybrid classes and refresher training.

The DLF division also provides support for faculty conference attendance and additionally hosts an annual professional development 2-day conference for both full-time and adjunct faculty. Additionally, the DLF team coordinates pre-semester professional development activities for all faculty.

The Technology Department recently completed a redesign of many program gateway and core courses for the use of new technologies to support student learning. This redesign was completed using the Quality Matters online course design standards after several weeks of QM training.

Many of our program faculty have recently completed the Association of College and University Educators and the American Council on Education (ACUE) 25 week training in its Effective Practice Framework

**J. Adequacy of Library Resources** (as outlined in COMAR 13B.02.03.12).

1. Describe the library resources available and/or the measures to be taken to ensure resources are adequate to support the proposed program.

Students may borrow circulating materials from any of the three CSM library branches. Through the interlibrary loan program (ILL), students can order almost any book, periodical article, or ERIC document needed, generally available within one week of the request. Library resources also include audiovisual collections used in the library and classrooms only. Additionally, substantial material is available through online databases, including ProQuest and EBSCO.

CSM is committed to assure that appropriate library resources are available to support the needs of all academic programs, including this program which has similar library requirements as the other Technology programs.

**K. Adequacy of Physical Facilities, Infrastructure and Instructional Equipment** (as outlined in COMAR 13B.02.03.13)

1. Provide an assurance that physical facilities, infrastructure and instruction equipment are adequate to initiate the program, particularly as related to spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences.

The proposed Data Science program is composed of existing classes in Math and Technology Department programs and will enjoy the same access to physical facilities, infrastructure and instruction equipment as well as spaces for classrooms, staff and faculty offices, and laboratories for studies in the technologies and sciences.

The Technology Department has dedicated an Open Tech lab at each campus to provide space and resources for Technology study groups, Technology club meetings, and student led lab projects. The computer lab at Prince Frederick is especially dedicated to Data Science students and the lab supports Data Science students in other campuses' Open Labs with Zoomed meetings and shared projects.

For classes offered in virtual, hybrid, and Hy-Flex instructional modalities, CSM utilizes video conferencing equipment built into the computer labs and classrooms. Faculty may also use portable OWL 360 all-in-one video conferencing units as needed.

All CSM faculty are provided with a laptop and an additional monitor to support virtual instruction and student office hours.

2. Provide assurance and any appropriate evidence that the institution will ensure students enrolled in and faculty teaching in distance education will have adequate access to:

a) An institutional electronic mailing system, and

CSM provides all students, faculty, and staff with a free institutional electronic mail account, along with free access to O365 online and the ability to download MS Office at home. Additionally, CSM students have access with the same account to MS Azure software downloads. CSM's IT Help Desk supports students with (re)gaining access to these accounts as needed.

b) A learning management system that provides the necessary technological support for distance education

CSM hosts all of its courses on Brightspace D2L which provides a common platform for in-person as well as online students to access announcements, syllabi, coursework, and grades. The institutional Help Desk supports student access and the CSM Distance Learning and Faculty Development (DLF) office provides dedicated staff and LMS training courses to provide robust support for faculty use of the LMS.

**L. Adequacy of Financial Resources with Documentation** (as outlined in COMAR 13B.02.03.14)

1. Complete **Table 1: Resources and Narrative Rationale**. Provide finance data for the first five years of program implementation. Enter figures into each cell and provide a total for each year. Also provide a narrative rationale for each resource category. If resources have been or will be reallocated to support the proposed program, briefly discuss the sources of those funds.

The program plans on hiring one new faculty member to support the new students and courses in Data Science.

<b>TABLE 1: RESOURCES</b>					
<b>Resource Categories</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
1. Reallocated Funds	0	0	0	0	0
2. Tuition/Fee Revenue	\$74,385	\$105,165	\$135,945	\$166,725	\$197,505
(c + g below)					
a. Number of F/T Students	10	15	20	25	30
b. Annual Tuition/Fee Rate (\$151 x 21 credits)*	\$3,591	\$3,591	\$3,591	\$3,591	\$3,591
c. Total F/T Revenue (a x b)	\$35,910	\$53,865	\$71,820	\$89,775	\$107,730
d. Number of P/T Students	15	20	25	30	35
e. Credit Hour Rate	\$171	\$171	\$171	\$171	\$171
f. Annual Credit Hours Rate	15	15	15	15	15
g. Total P/T Revenue	\$38,475	\$51,300	\$64,125	\$76,950	\$89,775
(d x e x f)					
3. Grants, Contracts & Other	0	0	0	0	0
External Sources					
4. Other Sources	0	0	0	0	0
TOTAL (Add 1 – 4)	\$74,385	\$105,165	\$135,945	\$166,725	\$197,505
* The credit hour rate (\$171) is based upon CSM's current tuition rate of \$137 plus 25% combined fee.					

<b>TABLE 2: EXPENDITURES:</b>					
<b>Expenditure Categories</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
1. Faculty (b + c below)	\$70,000	\$70,000	\$70,000	\$70,000	\$70,000
a. # FTE	1 FT x 5	1 FT x 5	1 FT x 5	1 FT x 5	1 FT x 5
b. Total Salary	\$70,000	\$70,000	\$70,000	\$70,000	\$70,000
c. Total Benefits	0	0	0	0	0
2. Admin. Staff (b + c below)	0	0	0	0	0
a. # FTE	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
3. Support Staff (b + c below)	0	0	0	0	0
a. # FTE	0	0	0	0	0
b. Total Salary	0	0	0	0	0
c. Total Benefits	0	0	0	0	0
4. Equipment	0	0	0	0	0
5. Library	0	0	0	0	0
6. New or Renovated Space	0	0	0	0	0
7. Other Expenses	0	0	0	0	0
TOTAL (Add 1 – 7)	\$70,000	\$70,000	\$70,000	\$70,000	\$70,000

**M. Adequacy of Provisions for Evaluation of Program** (as outlined in COMAR 13B.02.03.15).

**1. Discuss procedures for evaluating courses, faculty and student learning outcomes.**

CSM conducts course evaluations every semester or, more often when deemed necessary. Evaluations are initiated by faculty and approved by the department chair and school dean. CSM's Curriculum and Instruction Committee reviews and approves curriculum recommendations.

To address online academic rigor and faculty presence, in coordination with our Distance Learning and Faculty Development (DLF) division, our online courses undergo additional review through our internal Online Academic Rigor and Presence (OARP) process. Our OARP process is comprised of a self-review followed by peer review and remediation.

Faculty are evaluated annually according to the process outlined in CSM's "Faculty Handbook".

CSM's Academic Planning and Assessment's office's focus is the primary mission of the college: to provide quality opportunities for intellectual development that result in student learning. Our Student Learning Outcomes Assessment Plan (SLOAP) outlines the process of collecting information to determine whether CSM's academic offerings are having the appropriate educational impact on students. Student Learning Outcomes Assessment (SLOA) is defined as the systematic collection of information about academic offerings and analysis thereof, for the purpose of improving student learning.

2. Explain how the institution will evaluate the proposed program's educational effectiveness, including assessments of student learning outcomes, student retention, student and faculty satisfaction, and cost-effectiveness.

Program Assessment at CSM is a cyclical process that includes:

1. Program Reviews conducted every five-six years, or more often as needed.
2. Academic certificate programs are included within the review of degree programs.
3. Program Monitoring conducted every other year (except in the year of a Program Review).
4. Program Assessments of Student Learning conducted on a cycle established by faculty.

**N. Consistency with the State's Minority Student Achievement Goals** (as outlined in COMAR 13B.02.03.05).

1. Discuss how the proposed program addresses minority student access & success, and the institution's cultural diversity goals and initiatives.

One of CSM's Values/Guiding Principles is Diversity. The Institutional Equity and Diversity Office works to "create an environment that instills an appreciation and understanding of the diverse qualities each of us brings to this campus; where our students, staff, and faculty mirror the community we serve and are free from discrimination and harassment."

Additionally, CSM defines civility as "the demonstration of respect for others through basic courtesy and the practice of behaviors that contribute toward a positive environment for learning and working." CSM has recently appointed the first Distinguished Faculty of Diversity, Equity, and Inclusion director, a Technology department colleague leading the initiative college wide where "faculty members are challenged to engage differences as strengths in an environment that constantly strives for equity of access, opportunity, resources, representation, and participation." (<https://www.csmd.edu/news/2022/professor-daphne-powell-is-selected-as-first-recipient-of-the-dr.-maureen-murphy-distinguished-professorship-for-equity-in-education.html>) The Data Science program will be included in the same departmental work on identifying and addressing diversity and equity challenges currently engaging our other Technology department programs.

CSM has maintained a Men of Excellence program "as a college-wide initiative to improve the recruitment, success, retention, graduation, and transfer rates of African American men who enter as first-time, full- or part-time students at the college." (<https://www.csmd.edu/student-services/student-life/men-of-excellence.html>). The Data Science program will benefit from the support available to recruit and graduate more African American program students.

CSM serves a region with a high number of active military and veterans working and studying at the Patuxent River Naval Air Station and Naval Surface Warfare Center Dahlgren Division. The Technology Department in particular draws a large enrollment of students with a military background. CSM has been officially "identified as a veteran- and military-friendly institution." (<https://www.csmd.edu/student-services/veteran-military/index.html>). Military veteran students in CSM's Data Science program would enjoy the same benefits and support as their Technology department fellow students.

As is true of CSM, the Data Science AS Program will be accessible to all students with no restrictions reference to age, gender, or ethnic background. As such, any student meeting the eligibility requirements of the college admissions process is entitled to enroll in this discipline of study. Furthermore, CSM, the Technology Department, the School of Professional and Technical Studies, and representatives of the Data Science AS Program all participate in events, programs, orientations, and information sessions sponsored internally or by external advocates in order to reach all students seeking information on the college's programs and the professional opportunities that result from that education and training.

CSM's marketing department is developing a comprehensive marketing plan for this new program. These resources include the designing and printing of brochures, assistance with marketing campaigns (web and traditional news media), and development of other recruitment materials. CSM is committed to ensuring new programs are marketed to diverse populations, as demonstrated by the organizational values, which include valuing diversity. Marketing plans will include activities specifically designed to market the program to the diverse population of the tri-county region.

Diversity and multiculturalism are vitally important issues for future leaders. As such, the representatives of this new program at CSM intend to contact multiple professional associations, national, regional and local employers, secondary and postsecondary institutions to create partnerships that will lead to the diversity of our student population and graduates of our programs.

**O. Relationship to Low Productivity Programs Identified by the Commission:**

1. If the proposed program is directly related to an identified low productivity program, discuss how the fiscal resources (including faculty, administration, library resources and general operating expenses) may be redistributed to this program.

The proposed degree is not directly related to an identified low productivity program identified by the Commission.

**P. Adequacy of Distance Education Programs (as outlined in COMAR 13B.02.03.22)**

1. Provide affirmation and any appropriate evidence that the institution is eligible to provide Distance Education
2. Provide assurance and any appropriate evidence that the institution complies with the C-RAC guidelines, particularly as it relates to the proposed program.

This program will not be offered exclusively as a distance education program but is designed to be offered in a combination of face to face, online as well as hybrid formats. As is the case for all CSM programs, CSM complies with C-RAC requirements for Online Learning